

Application No. 10/528,495  
Paper Dated: February 18, 2009  
In Reply to USPTO Correspondence of November 18, 2009  
Attorney Docket No. 0470-050862

### **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

#### **Listing of Claims**

Claims 1-44 (Cancelled).

Claim 45 (Currently Amended): A hearing aid/spectacles combination comprising a spectacle frame and a first reproduction unit, wherein the spectacle frame has a first spectacle arm with a microphone array, the microphone array is equipped to pick up a sound signal and to transmit a processed signal produced on the basis thereof to the first reproduction unit, and the first reproduction unit is equipped to convert the processed signal into a processed sound signal, wherein the hearing aid/spectacles combination comprises:

a sound registration module that comprises the microphone array;

a beam forming module for forming a direction-dependent processed signal;

a reproduction adaptation module for adapting a reproduction characteristic of the processed sound signal produced by the first reproduction unit;

a reproduction module that comprises the first reproduction unit; and

a reproduction control module for controlling a reproduction characteristic of the processed sound signal produced by the first reproduction unit, and, in that the beam forming module and the reproduction adaptation module are based on digital techniques, wherein the beam forming module and the reproduction adaptation module are arranged such that they can be either:

integrated with a mobile telephone, the hearing aid/spectacles combination being equipped as a hands-free set, in which the microphone array is arranged as input for speech for

the mobile telephone and the beam forming module is used to generate a beam that, essentially, comprises sound of a user's own voice; or

connected to a mobile telephone, the hearing aid/spectacles combination being equipped as a hand-free set, in which the microphone array is arranged as input for speech for the mobile telephone and the beam forming module is used to generate a beam that, essentially, comprises sound of a user's own voice; or

integrated with either personal audio equipment or a personal information management system.

Claim 46 (Cancelled).

Claim 47 (Previously Presented): The hearing aid/spectacles combination according to claim 45, wherein the beam forming module and the reproduction adaptation module are accommodated in a processing unit.

Claim 48 (Cancelled).

Claim 49 (Currently Amended): A hearing aid/spectacles combination comprising a spectacle frame and a first reproduction unit, wherein the spectacle frame has a first spectacle arm with a microphone array, the microphone array is equipped to pick up a sound signal and to transmit a processed signal produced on the basis thereof to the first reproduction unit, and the first reproduction unit is equipped to convert the processed signal into a processed sound signal, wherein the hearing aid/spectacles combination comprises:

a sound registration module that comprises the microphone array;

a beam forming module for forming a direction-dependent processed signal;

a reproduction adaptation module for adapting a reproduction characteristic of the processed sound signal produced by the first reproduction unit;

a reproduction module that comprises the first reproduction unit; and

a reproduction control module for controlling a reproduction characteristic of the processed sound signal produced by the first reproduction unit, and, in that the beam forming module and the reproduction adaptation module are based on digital techniques, wherein:

the sound registration module, the processing unit and the reproduction module being equipped for wireless communication with one another; and

~~The hearing aid/spectacles combination according to claim 48, wherein the wireless communication is~~ communication being possible only over a distance of less than one metre.

Claim 50 (Currently Amended): A hearing aid/spectacles combination comprising a spectacle frame and a first reproduction unit, wherein the spectacle frame has a first spectacle arm with a microphone array, the microphone array is equipped to pick up a sound signal and to transmit a processed signal produced on the basis thereof to the first reproduction unit, and the first reproduction unit is equipped to convert the processed signal into a processed sound signal, wherein the hearing aid/spectacles combination comprises:

a sound registration module that comprises the microphone array;

a beam forming module for forming a direction-dependent processed signal;

a reproduction adaptation module for adapting a reproduction characteristic of the processed sound signal produced by the first reproduction unit;

a reproduction module that comprises the first reproduction unit; and

a reproduction control module for controlling a reproduction characteristic of the processed sound signal produced by the first reproduction unit, and, in that the beam forming

module and the reproduction adaptation module are based on digital techniques. ~~The hearing aid/spectacles combination according to claim 45, wherein:~~

the microphone array comprises a number of microphones placed some distance apart from each other in a longitudinal direction of the first spectacle arm; and

the sound registration module comprises, in addition to the microphone array, an analogue/digital converter for each microphone of the microphone array, a multiplexer connected to outputs of the analogue/digital converters, a transmitter, connected to the multiplexer, and a power source.

Claim 51 (Previously Presented): The hearing aid/spectacles combination according to claim 50, wherein each analogue/digital converter is of a sigma-delta type.

Claim 52 (Previously Presented): The hearing aid/spectacles combination according to claim 50, wherein each analogue/digital converter comprises a low-pass filter characteristic.

Claim 53 (Previously Presented): The hearing aid/spectacles combination according to claim 50, further including a demultiplexer, wherein the beam forming module comprises a finite impulse response filter for each microphone connected to the demultiplexer, as well as a summator connected to outputs of the filters.

Claim 54 (Previously Presented): The hearing aid/spectacles combination according to claim 45, wherein the reproduction adaptation module comprises an equaliser/compressor that is equipped to process frequency and amplitude of a signal received from the beam forming module.

Claim 55 (Previously Presented): The hearing aid/spectacles combination according to claim 54, wherein the equaliser/compressor is provided with a compression function with optimised response time and decay time constants.

Claim 56 (Previously Presented): The hearing aid/spectacles combination according to claim 54, wherein the equaliser/compressor is provided with a multi-channel frequency-dependent compression function.

Claim 57 (Previously Presented): The hearing aid/spectacles combination according to claim 45, wherein the reproduction control module comprises a separate control unit for generating reproduction control signals.

Claim 58 (Previously Presented): The hearing aid/spectacles combination according to claim 45, wherein the beam forming module and the reproduction adaptation module are equipped to store at least one preferred setting.

Claim 59 (Previously Presented): The hearing aid/spectacles combination according to claim 45, wherein the reproduction module comprises a digital/analogue converter, an output amplifier, connected to the digital/analogue converter, and an earphone connected to the output amplifier.

Claim 60 (Previously Presented): The hearing aid/spectacles combination according to claim 59, wherein the reproduction module also comprises an equaliser and a compressor.

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Claim 61 (Previously Presented): The hearing aid/spectacles combination according to claim 60, wherein the compressor is provided with a compression function with optimised response time and decay time constants.

Claim 62 (Previously Presented): The hearing aid/spectacles combination according to claim 60, wherein the compressor is provided with a multi-channel frequency-dependent compression function.

Claim 63 (Previously Presented): The hearing aid/spectacles combination according to claim 45, further including a second spectacle arm that is of identical construction to the first spectacle arm, as well as a second reproduction unit that is of identical construction to the first reproduction unit.

Claim 64 (Previously Presented): A hearing aid system comprising a hearing aid/spectacles combination according to claim 45 and at least one of a mobile telephone, personal audio equipment and a personal information management system.

Claim 65 (Previously Presented): A hearing aid/spectacles combination comprising components, function modules and a reproduction control module arranged to control said function modules,

the components being connected to one another and comprising at least a spectacle frame and a first reproduction unit, the spectacle frame having at least one spectacle arm with a microphone array, the microphone array being equipped to pick up a sound signal and to transmit a processed signal produced on the basis thereof to at least one reproduction unit, and

the at least one reproduction unit being equipped to convert the processed signal into a processed sound signal,

the function modules encompassing a sound registration module for registering sound, a beam forming module for forming a direction-dependent processed signal, a reproduction adaptation module for adapting a reproduction characteristic for sound to be reproduced, and a reproduction module for reproducing the sound to be reproduced on the basis of a reproduction characteristic and as controlled by the reproduction control module, and

at least one of the components being arranged to perform functions of several of the function modules such that performing of functions of function modules can be distributed differently over said components in different use situations, the reproduction control module storing different function scenarios for said different use situations, and being arranged to receive an input selection signal for one of said use situations, to assign at least one of the function modules to one or more of the components based on said input selection signal, and each of the components that got a function module assigned uses its capacity to performing the function of the at least one function module assigned to that component.

Claim 66 (Previously Presented): The hearing aid/spectacles combination according to claim 65, wherein each of the components is connected to each of the other components by means of a wireless link.

Claim 67 (Previously Presented): The hearing aid/spectacles combination according to claim 65, wherein the hearing aid/spectacles combination is configured as a hearing aid for directional hearing, as an audio player or as a GSM headset.

Claim 68 (Previously Presented): The hearing aid/spectacles combination according to claim 65, wherein:

the spectacles frame is arranged for wireless transmission of the processed signal to the at least one reproduction unit; and

the functions of the function modules are distributed over the components as follows:

sound registration module in the microphone array,

beam forming module in the frame, and

both the reproduction adaptation module and the reproduction module in the at least one reproduction unit.

Claim 69 (Previously Presented): The hearing aid/spectacles combination according to claim 65, further including a control unit, wherein:

said combination can be configured as an audio player for reproducing signals from an audio source;

the control unit is equipped to receive an audio input signal and to performing wireless transmission to the at least one reproduction unit; and

the functions of the function modules are distributed over the components as follows:

sound registration module in the control unit for the audio input signal,

reproduction adaptation module in the control unit, and

reproduction module in the at least one reproduction unit.

Claim 70 (Previously Presented): The hearing aid/spectacles combination according to claim 65, further including a control unit, wherein:



said combination can be configured as a headset in a communication link for an incoming communication signal and an outgoing communication signal, wherein:

the control unit is equipped for wireless transmission to the at least one reproduction unit and for connection to the communication link for receiving the incoming communication signal and for transmitting the outgoing communication signal; and

the functions of the function modules are distributed over the components as follows:

sound registration module in the control unit from the incoming communication signal,

reproduction adaptation module in the control unit, and  
reproduction module in the at least one reproduction unit.

Claim 71 (Previously Presented): The hearing aid/spectacles combination according to claim 70, wherein the hearing aid is arranged to form the outgoing communication signal by:

registration of speech of a user of the hearing aid in the sound registration module via the microphone array to render a registered sound signal; and

selection of a speech signal from the registered sound signal by the beam forming module and reproduction adaptation module in at least one of the microphone array, the control unit and the reproduction unit; and

provision of the speech signal as outgoing communication signal for the communication link.

Claim 72 (Previously Presented): The hearing aid/spectacles combination according to claim 71, wherein the selection of the speech signal from the registered sound signal

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by the beam forming module and reproduction adaptation module comprises a focusing technique, wherein the focusing technique determines the sound that in use comprises the user's speech from the recorded sound signal as speech signal.

Claim 73 (Previously Presented): The hearing aid/spectacles combination according to claim 71, wherein the beam forming module and reproduction adaptation module provide a reduced sound signal from the registered sound signal for the reproduction module, from which reduced sound signal the speech signal is essentially removed and to which reduced sound signal the incoming communication signal is added.

Claim 74 (Previously Presented): The hearing aid/spectacles combination according to claim 65, wherein the components each comprise at least one digital circuit for performing functions of one or more of the function modules.